Adaptation to Climate Change

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Policy Brief

Adaptation to climate change must be integrated into development plans and programs

Indonesia boasts of having one of the longest coastlines in the world, rich marine biodiversity, and highly productive agriculture and fisheries sectors. **This natural wealth, however, is at risk of being damaged by sea-level rise, flooding, drought, and landslides** – some of the predicted devastating effects of global climate change.

Climate change will mainly affect populations living on the coast and those dependent on climate-sensitive agriculture or fisheries for their livelihoods. This means that **65 percent of Indonesians living in coastal areas will be affected**, both in densely populated coastal cities as well as in low-lying fishing communities. This also means that rural communities that earn their living from agriculture, fisheries and forest-based activities will be hit hard. Unfortunately, these communities tend to be the poorest of the Indonesian population, with few assets to cope with the impact of climate change.

The expected impact of climate change in Indonesia is likely to be large but is still difficult to quantify. **Calculations of the long-term direct and indirect impacts to Indonesia's economy indicate significant costs**. By 2100, GDP loss is projected to reach 2.5 percent, which is four-times the global mean GDP loss from climate change. If the chance of catastrophic events is considered, the losses could go as high as seven percent

Coastline in East Nusa Tenggara
Photo: Endro Adinugroho

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of GDP. This is a significant cost for a country that has successfully emerged from the economic crisis of the late 1990's.

To protect the poorest populations and prevent economic costs that undermine development achievements, the Government should immediately begin to adopt climate change adaptation measures. Many adaptation options exist, covering water resources, agriculture, forestry, coastal/marine, and health. **Integrating such options into development planning and implementation will be one of Indonesia's biggest challenge in the decades to come.**

Indonesia is extremely vulnerable to climate change

As an archipelago, Indonesia is vulnerable to multiple climate change hazards. Though the precise magnitude of these hazards cannot be predicted, some of the most significant ones are estimated to be:

- **Modest temperature increase**. The mean temperature in Indonesia has already increased by 0.3°C (observed since 1990). The year 1998 was the warmest year in the century, with almost 1°C increase (from the 1961-1990 average).
- **More intense rainfall**. It is predicted that due to climate change, Indonesia will have 2-3 percent more rainfall per year and shorter rainy seasons (fewer number of rainy days in a year), which then significantly increases the risk of flooding. This will change the water balance in the environment and affect hydroelectricity generation and drinking water supply.
- **Sea level rise**. Areas with dense population will be most affected by sea level rise. And there are around 40 million Indonesians living within 10 meters of the average sea level, meaning they are the most vulnerable to sea level changes.
- **Food security**. Climate change will alter precipitation, evaporation, run-off water, and soil moisture; and hence will affect agricultural productivity. Soil fertility is likely to decline by two to eight percent in the long-term, resulting in a projected decrease in rice yield by four percent per year, soybean by 10 percent and maize by 50 percent per year. In addition, sea level rise will inundate coastal ponds, affecting fish and prawn production throughout the country.
- **Affect on marine biodiversity**. It is estimated that the changing climate will increase Indonesia's ocean water temperature by 0.2 to 2.5°C. This will put additional pressure on Indonesia's 50,000 km^2 of coral reefs, which are already in dire straits. Coral bleaching is expected to increase as a result of rising ocean water temperatures, as has been observed during past El Nino events.
- **A greater water- and vector- borne disease burden**. Although the link between climate change and health problems is poorly researched, there is some potential for water and vector borne diseases to increase. Some speculate that the rise of number of dengue fever cases during rainy seasons in Indonesia could have been partially caused by a warmer climate.

Adaptation options for a changing climate

Adapting to climate change involves a combination of reactive and proactive interventions in many

A MORE SUSTAINABLE INDONESIA is one where:

- The costs of environmental degradation and climate change are lowered so that less wealth is diverted from growth;
- Good environmental management contributes to poverty alleviation by reducing impacts on the poor and better sharing of benefits;
- Renewable resources are used sustainably while non-renewable ones are wisely developed for investment in human and physical capital; and
- Citizens are aware of and participating in environmental issues directly or through their representatives and other organizations.

Climate Change Adaptation Options

	Reactive/Responsive	Proactive/Anticipatory
Water Resources	• Protection of groundwater resources • **Improved management and maintenance of existing water supply systems** • **Protection of water catchment areas** • **Improved water supply** • Groundwater and rainwater harvesting and desalination	• Better use of recycled water • **Conservation of water catchment areas** • Improved system of water management • Water policy reform including pricing and irrigation policies • **Development of flood controls and drought monitoring**
Agriculture	• Erosion control • **Dam construction for irrigation** • **Changes in fertilizer use and application** • **Introduction of new crops** • **Soil fertility maintenance** • Changes in planting and harvesting times • Switching to different cultivars • Educational and outreach programs on conservation and management of soil and water	• **Development of tolerant/resistant crops (to drought, salt, insect/pests)** • **Research and development** • **Soil and water management** • **Diversification and intensification of food and plantation crops** • Policy measures, tax incentives/subsidies, free market • Development of early warning systems
Forestry	• **Improvement of management systems including control of deforestation, reforestation, and afforestation** • Promoting agroforestry to improve forest goods and services • Development/improvement of national forest fire management plans • **Improvement of carbon storage in forests**	• **Creation of parks/reserves, protected areas and biodiversity corridors** • Identification/development of species resistant to climate change • Better assessment of the vulnerability of ecosystems • Monitoring of species • Development and maintenance of seed banks • **Forest fire early warning systems**
Coastal/ Marine	• Protection of economic infrastructure • **Public awareness to enhance protection of coastal and marine ecosystems** • Building sea walls and beach reinforcement • **Protection and conservation of coral reefs, mangroves, sea grass, and littoral vegetation**	• Integrated coastal zone management • Better coastal planning and zoning • Development of legislation for coastal protection • **Research and monitoring of coasts and coastal ecosystems**
Health	• Public health management reform • Improved housing and living conditions • **Improved emergency response**	• **Development of early warning systems** • **Better and/or improved disease/vector surveillance and monitoring** • Improvement of environmental quality • Changes in urban and housing design

PS: The options in bold are already called for in Indonesia's National Action Plan

For further information, please contact:
World Bank Office Jakarta
Indonesia Stock Exchange Building, Tower 2, 12th floor
Jl. Jenderal Sudirman Kav. 52-53, Jakarta 12190 - Indonesia
Ph. 62-21 5299 3000 fax. 62-21 5299 3111

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sectors. The Government of Indonesia has already incorporated some adaptation options in Indonesia's National Action Plan Addressing Climate Change and National Development Planning Responses to Climate Change (see items in box, highlighted in bold). Other adaptation options are also available and should be considered.

The cost of adaptation may be high. Estimates show that for Indonesia and three other countries in Southeast Asia, the cost of adaptation for the agriculture and coastal zones would be, on average, about USD 5 billion per year by 2020. However, for Indonesia, **by 2050, the annual benefit of avoiding damages from climate change is likely to exceed the annual cost**. By 2100, it is predicted that the benefit could reach 1.6 percent of GDP (compared to the cost at 0.12 percent of GDP).

As a massive adaptation agenda will be unmanageable if addressed simultaneously, it is **necessary to select and prioritize options and activities**. A guide to prioritize options for adapting to climate change is provided in the 2010 World Bank Development Report. This involves four steps to:

1. Prioritize investment and policy options that provide economic and social benefits in addition to helping adapt to climate change,
2. Increase climate resilience by adding 'safety margin' in new investments,
3. Favor reversible and flexible options, and
4. Plan adaptation actions based on scenario analysis; review and adjust the scenarios according to new information.

Adaptation to climate change should be integrated to mainstream development programs. It is important that local capacity for adaptation be strengthened, including improving central-local coordination, planning and financing. The public should also be made more aware about climate change, and resilience of poor households and other vulnerable groups should be improved. More studies will also be needed to gain a better understanding of the local impacts of climate change.

Background information on CEA Report

The Country Environmental Analysis (CEA) report highlights underlying challenges to Indonesia's environment and management of its natural resources. The initial purpose in preparing the report was to guide World Bank support to Indonesian institutions for more sustainable development. However, the report also provides information that may contribute to the Government's medium term development plans under the policies of the new administration.

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